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ABSTRACT

Girls tend, far less than boys, to opt for science or technical subjects in upper secondary school and higher education. A plan to study females' experiences, ideas, and attitudes to science and technology is reviewed in this report. The study's intent is to follow two groups of Swedish students from the beginning of grade 7 to their choice of upper secondary school in grade 9. The observations will concentrate on physics, chemistry, and technology because it is these subjects, not biology, which are believed to be stumbling blocks for girls. The study will employ a qualitative method, using several different techniques, lesson observations, talks with teachers, questionnaire surveys, and interviews. Since this report is a preliminary review of the project, only general impressions of the first year's progress are stated. (ML)

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TITLE OF PROJECT: GIRLS IN SCIENCE AND TECHNOLOGY

Girls tend far less than boys to opt for science or technical subjects in upper secondary school and higher education. This project takes as its starting point the desirability of recruiting more women for science and technology and the responsibilities and importance of schools in this connection. The plan is to study pupils' - and above all, girls' - experience and ideas of, and attitudes to, science and technology during the senior level grades of compulsory school. Two groups of pupils are being followed up continuously from the beginning of grade 7 to their choice of upper secondary schooling in grade 9. The intention is, by means of classroom observations, questionnaires and interviews, to find out how the pupils themselves think and what goes on in the classroom. What changes, if any, occur during senior level?

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PROJECT NO.: 2302

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BACKGROUND AND PURPOSE

Many years' work as a mathematics and chemistry teacher, coupled with a general interest in the social condition of women, have made me actively concerned with the situation for girls in school, especially as regards science and technology. As a teacher, supervisor and - for a time - methods lecturer, I have had ample opportunity of observing girls during science lessons.

One thought which occurred to me was that there were many talented girls taking the Social Line who could very well have coped with the Science or Technology Line. A pedagogics thesis gave me the opportunity of examining the choices made by pupils with high average marks, and this confirmed that many girls chose other alternatives instead of three- and four-year lines, to a much greater extent than boys did. I also knew from my teaching experience that many girls who had actually chosen the Science or Technology Line and had obtained high marks in compulsory school still seemed to have little self-confidence. Many girls were also very reticent in the classroom.

In connection with the above mentioned degree thesis, I tried, by asking the pupils questions, to penetrate their experience of senior level and to relate it to their choice of upper secondary schooling, but the findings were enigmatic. I thought that I needed to make observations on the spot, in classrooms, so as to understand what happened. At that time several reports had been published, especially in the UK, showing that teachers paid much more attention to boys than to girls. These findings were put down to the subordinate position of women in society.

As part of a teacher training assignment, general science lessons were observed in grades 3, 7 and 9 (one class each). In the junior level class, the situation resembled that described in other surveys, with the girls receiving about one-third of the "talk space" and the teacher's attention. In grade 7 things were different. Everything about physics and chemistry was new and exciting, and both boys and girls were interested. The girls, it is true, kept fairly quiet in

relation to the rest of the class, but they made sure of getting help from the teacher, who also distributed questions evenly between both sexes.

In grade 9, on the other hand, the girls seemed to split into two groups - one active and one passive. The passive girls had very few interactions with the teacher and were very much on the outside of the teaching. The boys acted quite differently. My conclusion was that, during senior level, something appeared to happen which changed and impaired the girls' situation. Was it something that happened in the classroom, something which, interacting with the girls' development, caused them to lose a great deal of their interest in science? These questions gave me the idea of following up one and the same class continuously all the way through senior level.

It was a general interest in the situation for women and girls in science which led me, together with Sylvia Benckert, a university lecturer in theoretical physics, to write an article for Kvinnovetenskaplig Tidskrift in which, among other things, we discussed the possibility of girls and boys respectively being attracted by different aspects of science. One important question concerned the effects of the masculine image of science.

In April 1985 I was able to take part in the Third International Conference on Girls And Science And Technology, GASAT, to which I contributed a paper summarising my observation study.

In Sweden the problem of girls, science and technology has mostly been treated as a question of recruitment. In schools this has above all related to the diminishing number of applicants for the Natural Science Line or the difficulty of recruiting students for the Machine-tools Operation Branch. Great efforts have been made by industry and society to attract more girls to technical occupations at all levels. In a shrinking labour market it is feared today that girls will educate themselves for unemployment by banking on traditional fields of study. Many and various efforts are being made to influence girls; it is girls who will have to change.

In my opinion, the reasons for girls' choices have been insufficiently elucidated. True, reference is made to the lack and necessity of models for girls, but the reasons for this shortage are seldom discussed.

The aim of my study is to find out how girls - and boys - actually think. For this reason I chose to follow pupils from the beginning of grade 7 to their choice of upper secondary schooling in grade 9. I am anxious to find out what they think about science and technology as presented in school, which aspects interest them, what they find difficult and what they find worth while. By following them over a longer period of time, I also hope to be able to see whether their attitudes change during this period and if so in what way. It will be particularly interesting if something decisive happens in the classroom, but I would also like to probe their attitudes to the role of science and technology in society.

METHOD

The study will employ a qualitative method, using several different techniques, lesson observations, talks with teachers, questionnaire surveys of pupils and interviews etc.

In the senior level school where the study is being conducted, the pupils are divided into groups of 16-20 for science and technology. The project will follow two such groups of 16 pupils each (15 girls and 17 boys altogether) throughout senior level, from grade 7 until their choice of upper secondarly schooling in grade 9. The observations will concentrate on physics, chemistry and technology, because it is these subjects, not biology, which are believed to be stumbling blocks for girls.

The classroom observations will be performed during frontal teaching, using observation checklists compiled in connection with the above mentioned teacher training thesis. When the pupils are doing laboratory or other independent work, I will also take part in it and note down the course of events afterwards.

Questionnaires - variously designed - will be administered on several occasions during the school year. At the beginning of the school year, data were collected on leisure interests and previous experience and expectations concerning senior level. Information about the subject items completed will be collected at the end of each term.

Talks and interviews with the pupils will take place in small groups or individually. The interviews will as a rule be tape-recorded.

Talks with the intermediate level teachers taking the pupils previously have supplemented the background information. Continuous discussions are being held with the teachers concerned.

PROGRESS SO FAR

Since the study began only recently, no findings can yet be presented. Instead, here are some of the impressions derived from one year's follow-up.

The first questionnaire, talks with the teachers and the first observations revealed great differences of social background. Furthermore, the girls are a good deal more mature than the boys when they start in grade 7. They express themselves better, they supply more detailed information about their interests and recollections.

As expected, the boys dominate the lessons verbally. But there is nothing to suggest that the girls have less aptitude than the boys; if anything, the opposite applies. Physics is no exception. If some boys, for example, know all the right words about electricity, this is offset by the girls finding it less difficult to follow instructions and working more carefully.

The girls appear more disposed than the boys to ask questions when there is something they do not understand. This is particularly true of the talented, confident girls, who find it important to understand things. Some of the boys occasionally criticise them on this account.

The superior maturity of the girls can, of course, enable them to cope better with their school work than the (more childish) boys are able to do, but there are also signs of their puberty causing other interests to gain the upper hand. Social background makes a difference here.

Co-operation with other researchers does a great deal to facilitate the work of analysis. Many contacts were established at the GASAT conference and I have above all collaborated with a number of Danish teachers and researchers. The fact of the project constituting a sub-project within HEKLA, a scheme of Nordic co-operation concerning the impact of educational reforms on women, provides abundant opportunities for comparing notes with other Nordic women's studies researchers.

The project will continue with collection of data during the 1986/87 school year, when the pupils are in grade 8, and data will also be collected during the 1987/88 school year until the pupils have chosen their lines of upper secondary school. Analysis should be completed during the 1988/89 school year.

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